

Simulations of Unsteady Effects and Dynamic Responses in Complex Valve Systems, Phase II

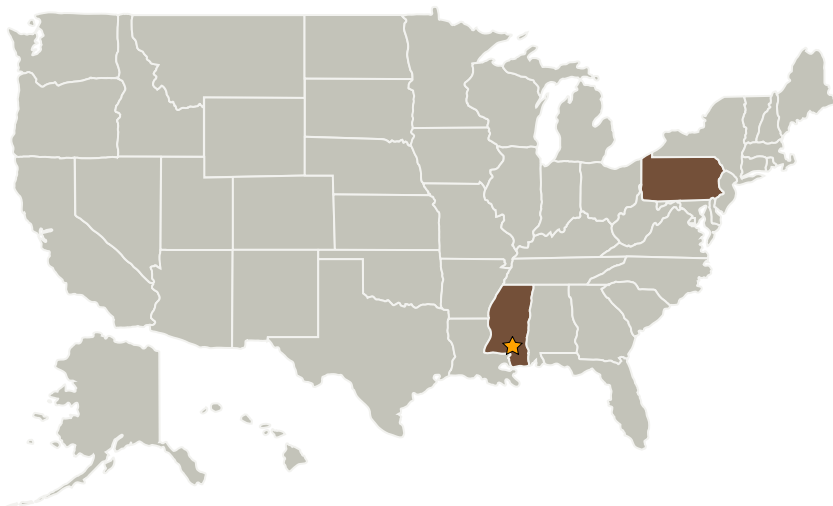
Completed Technology Project (2006 - 2008)



Project Introduction

Reliable diagnostic tools to support system health monitoring are critical both for liquid rocket experimental ground test facilities and flight systems. Here, flow induced instabilities can generate flow anomalies such as large scale pressure fluctuations that may couple with other system components and generate deleterious structural vibrations or lead to system malfunction as was evidenced in the RS-68 engine on the Delta IV system. Identifying the source of these flow instabilities is extremely difficult since they may arise from a variety of coupled phenomena such as hydrodynamics, valve timing and scheduling, and cavitation related events in cryogenic propellant and oxidizer feedlines. The proposed Phase II program addresses this deficiency; the product of this effort will be a reliable predictive tool that can characterize flow instabilities, identify dominant frequency modes, and elucidate structural response in valve and feed systems. Phase I activities demonstrated the simulation capability for instabilities in varied flow devices (e.g. venturis, orifices) used in the E-1 test facilities at NASA SSC. The Phase II work will extend this to include fluid-structure interaction for analysis of system vibration, structural damage and gauge valve response. Extensive validation will result in a predictive diagnostic tool for liquid rocket propulsion systems.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Stennis Space Center (SSC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Stennis Space Center(SSC)	Lead Organization	NASA Center	Stennis Space Center, Mississippi
CRAFT Tech - Combustion Research and Flow Technology	Supporting Organization	Industry	Pipersville, Pennsylvania

Primary U.S. Work Locations

Mississippi	Pennsylvania
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Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX15 Flight Vehicle Systems
 - └ TX15.1 Aerosciences
 - └ TX15.1.5 Propulsion Flowpath and Interactions